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The invention relates to a system for injecting into a fiber signals from multiple sources at different wavelengths. The signals from each source are injected into the fiber by a circulator. The circulators of the various sources are cascaded. Reflector means for reflecting signals from sources previously injected are provided between each source and its circulator. The invention is used to inject signals from multiple sources without the injection of signals from one source attenuating signals from sources previously injected. It applies in particular to Raman amplification, for which purpose it provides a multiband source without attenuation between bands. Multiband amplifications is achieved without loss of gain between bands.